

**STAFF REPORT
ON APPLIANCE RULEMAKING
FOR
CENTRAL AIR CONDITIONERS AND SMALL WATER HEATERS**

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CALIFORNIA ENERGY COMMISSION

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PART 1 — Central Air Conditioners and Heat Pumps

A. Historical Background

The Commission has regulated residential central air conditioners and heat pumps since 1976. In 1986, Congress passed the National Appliance Energy Conservation Act (NAECA) that included single-phase air-cooled air conditioners with cooling capacity up to 65,000 Btu per hour. The act included a schedule for upgrading these standards by DOE. A final rule was required by January 1, 1994. This rulemaking was repeatedly delayed for numerous reasons. The final rule was eventually published in the Federal Register on January 22, 2001. Despite Commission staff's active participation in the federal rulemaking, in September 2000, there was still considerable doubt whether the final federal rule would be completed during the current administration, and whether, if it was completed before the change of administration, it would be stringent enough to protect California's interests. At that time, the Energy Efficiency Committee instructed staff to include air conditioners in the planned rulemaking to respond to AB 970. The standards included in the staff drafts for the California standards were the levels proposed by the Commission and other energy efficiency advocates to DOE for the national standards.

The Commission has also regulated commercial air conditioners since 1976. Congress passed the Energy Policy Act of 1992 (EPAct) that included specific standard levels for single-phase air-cooled central air conditioners from 65,000 to 240,000 Btu per hour cooling capacity, and three phase air-cooled central air conditioners from the smallest to 240,000 Btu per hour cooling capacity. These levels were copied from ASHRAE/IESNA 90.1-1989. The Act indicates that whenever ASHRAE/IESNA 90.1 is updated, DOE must either adopt the new ASHRAE levels as new national standards or adopt more stringent standards that would save a significant amount of energy. When ASHRAE 90.1-1999 was published, it included levels for this type of equipment that are more stringent than the existing federal standards. DOE in a final rule for commercial equipment, published on January 12, 2001, adopted ASHRAE 90.1-1999 levels for some appliances, but none for air-cooled central air conditioners and heat pumps. The levels in the staff draft for the California rulemaking are Tier 2 levels from the Consortium for Energy Efficiency. They are more stringent than the ASHRAE levels that DOE decided not to adopt.

The Energy Efficiency Committee's 15-Day Language was published recently for both residential and commercial air-cooled central air conditioners for consideration and possible adoption by the Commission on February 7, 2001.

B. Federal Preemption

The national standards under both NAECA and EPCA are preemptive and thus the California standards cannot go into effect unless and until DOE issues a waiver from preemption. This fact is universally understood. Staff and the Energy Efficiency Committee recommend that the Commission adopt the proposed standards on February 7, 2001 and subsequently file a petition for waiver for some or all of the new standards. Decisions about details about this petition do not have to be made on February 7. The final petition, for instance, could cover some sizes of air conditioners and not others.

The Commission also needs to protect itself from possible repeal or weakening of the new DOE standards. In the past this has been necessary in three notable instances:

- DOE published proposed standards in June 1980. The new administration, acting under a court order, issued a final rule shortly thereafter in the form of no-standard standards which preempted California standards.
- During the 1990s Congress imposed a one-year moratorium on DOE development of new standards.
- During the late 1990s, several bills were introduced that would repeal the federal standards for plumbing products.

In addition, a number of last-minute regulations have reportedly had their publication delayed at the Federal Register office and/or their effective dates may be in jeopardy.

Thus, Commission staff and the Energy Efficiency Committee recommend that the Commission adopt the 15-Day Language.

C. Differences Between the New Federal Standards and the Proposed California Standards

Table 1 is copied directly from Table C-8 in the 15-Day Language and represents the proposed California standards.

Table 1
(Table C-8 in 15-Day Language)
**California Proposed Standards for Air-Cooled Air Conditioners
and Air-Source Heat Pumps**

<i>Appliance</i>	<i>Cooling Cap. (Btu/hr)</i>	<i>Up to December 31, 2005</i>	<i>Minimum Standard from January 1, 2006</i>
Air-cooled air conditioners	< 65,000	11.3 EER 13.0 SEER	11.6 EER 13.0 SEER
Air-source heat pumps	< 65,000	11.3 EER 13.0 SEER 7.9 COP	11.6 EER 13.0 SEER 7.9 HSPF
Air-cooled air conditioners	‡ 65,000 and < 135,000	11.0 EER	11.0 EER
Air-source heat pumps	‡ 65,000 and < 135,000	11.0 EER 3.4 COP at 47°F. 2.4 COP at 17°F.	11.0 EER 3.4 COP at 47°F. 2.4 COP at 17°F.
Air-cooled air conditioners	‡ 135,000 and < 240,000	10.8 EER	10.8 EER
Air-source heat pumps	‡ 135,000 and < 240,000	10.8 EER 3.3 COP at 47°F. 2.2 COP at 17°F.	10.8 EER 3.3 COP at 47°F. 2.2 COP at 17°F.

Table 2 compares the new federal standards for residential equipment with the California proposed rule:

Table 2
**Comparison of California and Federal Standards for Residential Air-Cooled
Air Conditioners and Air-Source Heat Pumps**

<i>Appliance</i>	<i>Cooling Cap (Btu/hr)</i>	<i>CA Minimum Standard From January 1, 2006</i>	<i>Federal Minimum Standards from January 23, 2006</i>
Air-cooled air conditioners (single phase)	< 65,000	11.6 EER 13.0 SEER	(no EER provision) 13.0 SEER
Air-source heat pumps (single phase)	< 65,000	11.6 EER 13.0 SEER 7.9 HSPF	(no EER provision) 13.0 SEER 7.7 HSPF

Table 3 compares the existing federal standards for commercial equipment with the California Proposed rule.

Table 3
Comparison of California and Federal Standards for Commercial Air-Cooled
Air Conditioners and Air-Source Heat Pumps

<i>Appliance</i>	<i>Cooling Capacity (Btu/hr)</i>	<i>CA Minimum Standard From January 1, 2006</i>	<i>Federal Minimum Standards from January 23, 2006</i>
Air-cooled air conditioners (three phase)	< 65,000	11.6 EER 13.0 SEER	(no EER provision) 10.0 SEER (split system) 9.7 SEER (single package)
Air-source heat pumps (three phase)	< 65,000	11.6 EER 13.0 SEER 7.9 HSPF	(no EER provision) 10.0 SEER (split system) 9.7 SEER (single package) 6.8 HSPF
Air-cooled air conditioners	‡ 65,000 and < 135,000	11.0 EER	8.9 EER
Air-source heat pumps	‡ 65,000 and < 135,000	11.0 EER 3.4 COP at 47°F. 2.4 COP at 17°F.	8.9 EER 3.0 COP at 47°F.
Air-cooled air conditioners	‡ 135,000 and < 240,000	10.8 EER	8.5 EER
Air-source heat pumps	‡ 135,000 and < 240,000	10.8 EER 3.3 COP at 47°F. 2.2 COP at 17°F.	8.5 EER 2.9 COP at 47°F.

D. Feasible and Attainable

The proposed standard easily meets the California Public Resources Code (25402(c)) criteria for feasibility and attainability. If each combination of manufacturer, cooling capacity and efficiency is considered to be one model, there are about 150 models that comply with the proposed California standards in the Commission's Database. Because of the practice of using various brand names and model numbers, there are hundreds more complying entries in the database. The Federal Register notice reports that the maximum technologically achievable rating is a SEER of 18.

E. Added Total Cost to the Consumer over the Design Life of the Appliance

The California Public Resources Code (25402(c)) states that standards shall not result in added total cost to the consumer over the design life of the appliance. Cost effectiveness has been calculated in several ways and meets the criteria, which ever way it is calculated:

The Federal Register notice includes the following three tables for residential air conditioners which show the affect of going from the current minimum standards to new minimums of 13 SEER for central air conditioners and 7.7 HSPF for heat pumps.

Table 4
(Table I.1 in Federal Register Notice)
Characteristics of Today s Typical Central Air Conditioners and Heat Pumps¹

	Split System Air Conditioner	Split System Heat Pump	Single Package Air Conditioner	Single Package Heat Pump
Average Installed Price	\$2,236	\$3,668	\$2,607	\$3,599
Annual Utility Bill ²	\$189	\$453	\$189	\$453
Life Expectancy	18.4 years	18.4 years	18.4 years	18.4 years
Energy Consumption per year	2,305 kWh	6,549 kWh	2,305 kWh	6,549 kWh

¹ "Typical" equipment has cooling and heating efficiencies of 10 SEER and 6.8 HSPF, respectively.

² Utility bill pertains to the energy cost of operating the air conditioner or heat pump.

Table 5
(Table I.2 in Federal Register Notice)
Implications of New Standards for the Average Consumer

	Split System Air Conditioner	Split System Heat Pump	Single Package Air Conditioner	Single Package Heat Pump
Year Standard Comes into Effect	2006	2006	2006	2006
New Average Installed Price	\$2,571	\$4,000	\$3,032	\$4,034
Estimated Price Increase	\$335	\$332	\$425	\$435
Annual Utility Bill Savings	\$42	\$70	\$42	\$70
Average Net Saving over Equipment Life	\$113	\$372	\$29	\$353
Energy Savings per Year	532 kWh	1081 kWh	532 kWh	1081 kWh

Table 6
(Table V.3 in Federal Register Notice)
Summary of Payback Period (Years)

Product Class	Efficiency Level (SEER)	Payback (Years) Using Reverse Engineering Costs	Payback (Years) Using ARI Mean Costs
Split System Central Air Conditioner	11	3.5	4.7
	12	4.5	5.8
	13	5.2	7.6
	18	7.3	11.3
Split System Heat Pump	11	1.3	2.5
	12	1.8	3.3
	13	3.2	4.5
	18	5.8	6.8
Single Package Air Conditioner	11	3.5	7.3
	12	3.3	6.2
	13	6.8	9.8
	18	8.6	13.3
Single Package Heat Pump	11	2.1	3.7
	12	1.8	4.0
	13	4.3	6.5
	18	5.4	7.2

Table V.3 dramatically indicates that the data provided to DOE by the manufacturers' trade association, ARI, results in much longer payback periods than that obtained by an independent contractor using the reverse engineering technique. It also indicates that even a model with a SEER of 18 has a simple payback period less than the estimated life of the appliance. The Federal Register notice questions the validity of the ARI data. However, using either assumption, the payback period is far less than the design life.

Commission staff calculated the cost effectiveness of the proposed California standards over the current federal standard using the method used for the Building Standards, for consistency with the newly adopted Building Standards; this shows:

Table 7
Cost Implications of Proposed California Standards¹

<i>Appliance</i>	<i>Estimated Design Life (Years)</i>	<i>Estimated Annual Statewide Sales (units)</i>	<i>Present Values for Electricity</i>	<i>Increase of Purchase Price Due to the Proposed Standard</i>	<i>Savings in Energy Costs Over Design Life of Appliance</i>	<i>Estimated Reduction in Electrical Energy Use Due to Proposed Standard (kWh/Unit/Yr)</i>	<i>Statewide Net Gain Over the Design Life of Appliance \$ Million</i>	<i>Added Total Cost Over the Design Life of the Appliance (\$)</i>
Commercial Air Conditioner	15	26,000	0.982	\$745	\$3,421	3484	\$1,043.6	-2676
Residential Air Conditioner	15	205,000	1.276	\$292	\$355	278	\$193.7	-63

¹The current California statewide average electricity costs for Commission payback calculations are: Current: \$0.167/kWh; for 2009: \$0.143/kWh; for 2012: \$0.179/kWh; for 2015: \$0.213/kWh.

The above calculations were based on comparing the current federal standard with the proposed California standard. With the publication of the new federal 13.0 SEER standard, staff has repeated these calculations but compared a 13.0 SEER air conditioner (with no EER provision) with a 13.0 SEER/11.3 EER model

F. EER Standard

California stakeholders (and other stakeholders in hot, dry climates) have been concerned that some manufacturers might find ways of meeting the new federal 13.0 SEER standard in ways that provide little or no savings at times of peak electrical demand. We, therefore, have included an EER standard in the California proposal and in our proposal to DOE as well as a SEER standard. EER is measured at 95° F, while SEER is measured at 82° F. An analysis of the Commission database indicates that SEER values are always higher than EER values. The difference between SEER and EER are as follows:

- Biggest difference between SEER and EER is 5.7
- Smallest difference between SEER and EER is 0.4
- Mean difference between SEER and EER is 2.13

- Median difference between SEER and EER is 1.90
- The median EER of all the models that comply with the new federal standard is 11.9
- The median EER of all the models that comply with the proposed Commission standard is 12.1
- The median EER of all the models that comply with the new federal standard but fail to achieve the proposed Commission standard is 11.1

Some compressors operate at dual or multiple speeds, thus dramatically improving the efficiency of the air conditioning unit at comparatively low outdoor ambient temperatures. California needs to make sure that efficiency of this design is also improved at higher outdoor ambient temperatures. The Federal Register notice recognizes this concern but DOE decided to respond to this concern by a future modification of the test for SEER.

Data supplied to the Commission by ACEEE (extracted from the DOE Technical Support Document) indicates that an increase from 10.8 EER to 11.6 EER would cost \$61.00 per unit. Since the increase we are considering is only a 0.2 EER, the cost for this small increase can be prorated at \$15.25. The savings would be 0.037 kW per unit, or 81 kWh per year per unit. It is cost effective to raise the efficiency of air conditioners from the federal standard of 13.0 SEER with no EER provision to 13.0 SEER with 11.6 EER.

G. Thermostatic Expansion Valves (TXVs)

The Commission has received convincing testimony that indicates that central air conditioners frequently do not perform as well in the field as they do in the test laboratory. However, the field performance for units with TXVs is markedly better than that of those without TXVs. A TXV is defined as a controlling device for regulating flow of refrigerant into a cooling unit, actuated by the changes in evaporator pressure and superheat of the refrigerant leaving the cooling unit. The basic response is to the superheat. Superheat is extra heat in a vapor when at a temperature higher than the saturation temperature corresponding to its pressure.

Some manufacturers claim that they have equipment that performs adequately without a TXV. For this reason, Commission staff, Carrier Corporation staff, and other participants developed the following wording (taken directly from the 15-Day Language):

Manufacturer s Option: Instead of installing a TXV, the manufacturer may install any other device that results in an EER_{95°} that is within 95% of the rated EER_{95°} at all of the following conditions:

- *Refrigerant charge at 90 percent of the refrigerant charge specified by the manufacturer of the appliance*
- *Refrigerant charge at 120 percent of the refrigerant charge specified by the manufacturer of the appliance*
- *Airflow at 80 percent of the airflow specified by the manufacturer of the appliance.*

With this language, it can be argued that no additional cost would be involved related to TXVs since the installation of TXVs is not required, as the manufacturer s option can be utilized. If, as some manufacturers claim, there is no problem, manufacturers already comply with the manufacturer s option and no extra expense would be incurred. Lennox International submitted test data showing that at least some of their models without TXV s meet the Manufacturer s Option. Should a manufacturer find it necessary to use a TXV for a model that currently does not have a TXV, the additional manufacturer s (per ACEEE) cost would be \$9.50. With markup, this becomes \$21.19 (ACEEE). The savings would be 130 kWh per year. This is a simple payback of 6.2 years.

Table 8

Incremental Energy Savings and Costs for CA Residential Unitary A/C and Heatpump Standards over Federal Standard Related to TXV s			
kWh savings	11.0%	%	from SEER 10
kWh savings	129.86	kWh	from SEER 10
kW	5.7%	%	from SEER 10
kW	0.16	kW	from SEER 10
Equipment life	18.0	Years	from DOE Technical Support Document
Incremental manuf. cost	9.50	\$	from Proctor "PG&E TXV Impact Review" Oct 23,
cost with markup	21.19	\$	2000 draft p.1-5

H. Space-Constrained Products

The new federal standard includes an exception for a new ill-defined class of products called space—constrained products. The following text is copied from the January 22, 2001 Federal Register:

today s final rule provides efficiency standards for all residential central air conditioners and heat pumps, except the niche products. We are referring to these products more generally as space-constrained products , since they are specifically intended for severely space-constrained applications. We define them as having the following characteristics:

- (1) *Rated cooling capacities no greater than 30,000 BTU/hr*
- (2) *An outdoor or indoor unit having at least two overall exterior dimensions or an overall displacement that:*
 - (a) *are (is) substantially smaller than those of other units that are*
 - (i) *currently usually installed in site-built single family homes, and*
 - (ii) *of a similar cooling, and, if a heat pump, heating, capacity, and*
 - (b) *if increased, would certainly result in a considerable increase in the cost of installation or would certainly result in significant loss in the utility of the product to the consumer.*
- (3) *Of a product type that was available for purchase in the United States as of December 1, 2000.*

Based on the information we have gathered thus far in this rulemaking, we believe space-constrained products would include equipment described as:

- *through-the-wall packaged and split*
- *ductless split*
- *single package and non-weatherized*

Clearly DOE staff is unclear exactly what this exception means since the Federal Register states that DOE plans a continuing rulemaking where the subject will be discussed further. DOE plans to publish a final rule no later than January 23, 2006. This exception is not in the proposed California standard and staff recommends that it not be added at this time. Hopefully a more meaningful definition of space-constrained products will be available from DOE by the time the Commission is ready to finalize its petition for exemption of preemption.

I. Conclusions

The proposed California standards are feasible and attainable. They do not result in added total cost to the consumer either when compared to the existing federal standard or the proposed 2006 federal standard. The Commission should adopt the proposed California standards:

- for additional savings in energy and peak demand
- as a backup in case the federal provisions are reduced or delayed
- because savings in California may well result in savings in the rest of North America.

J. Air Conditioner and Heat Pump Recommendations

Staff and the Committee recommend that the Committee's 15-Day Language be adopted without modifications. We recommend that these efficiency levels be used as the basis of any incentive programs for central air conditioning equipment in California to encourage higher performing equipment to help mitigate summer peak issues. We further recommend that the Commission consider seeking a waiver from federal preemption.

PART 2 — Small Water Heaters

A. Historical Background

The Commission has regulated water heaters since 1977. In 1986, Congress passed the National Appliance Energy Conservation Act (NAECA) that included domestic (small) size water heaters. The act included a schedule for upgrading these standards by DOE. A final rule was required by January 1, 1994. This rulemaking was repeatedly delayed for numerous reasons. The final rule was eventually published in the Federal Register on January 17, 2001. Despite Commission staff's active participation in the federal rulemaking, in September 2000, there was still considerable doubt whether the final federal rule would be completed during the current administration due to concerns and delays within the Department of Justice. At that time, the Energy Efficiency Committee instructed staff to include water heaters in the planned rulemaking to respond to AB 970. The standards included in the staff drafts for the California standards were the levels proposed by the Commission and other energy efficiency advocates to DOE for the national standards.

15-Day Language was published for small water heaters for consideration and possible adoption by the Commission on February 7, 2001.

B. Federal Preemption

The national standards under NAECA are preemptive and thus the California standards cannot go into effect unless and until DOE issues a waiver from preemption. This fact is universally understood. Staff and the Energy Efficiency Committee recommend that the Commission adopt the proposed amendment to the regulation on February 7, 2001 and subsequently file a petition for waiver for some or all of the new standards. Decisions about details about this petition do not have to be made on February 7. The final petition, for instance, could cover some types of water heaters and not others.

The Commission also needs to protect itself from possible repeal or weakening of the new DOE standards. In the past this has been necessary in three notable instances:

- DOE published proposed standards in June 1980. The new administration, acting under a court order, issued a final rule shortly thereafter in the form of no-standard standards which preempted California standards.
- During the 1990s Congress imposed a one-year moratorium on DOE development of new standards.
- During the late 1990s, several bills have been introduced that would repeal the federal standards for plumbing products.

In addition, a number of last-minute regulations have reportedly had their publication delayed at the Federal Register office and/or their effective date may be in jeopardy.

Thus, Commission staff and the Energy Efficiency Committee recommend that the Commission adopt the 15-Day Language.

C. Differences Between the New Federal Standards and the Proposed California Standards

The following table is copied directly from the 15-Day Language and represents the proposed California standards.

**Table 9
(Table F-5 from 15-Day Language)
Standards for Small Water Heaters**

<i>Appliance</i>	<i>Minimum Energy Factor</i>
Electric (including heat pump)	$0.97 - (.00132 \times V)$
Gas	$0.685 - (.0019 \times V)$
Oil	$0.59 - (.0019 \times V)$
V = storage volume in gallons.	

Table 9 compared the new federal water heater standards with the California proposed standard (see attachment Table 9 at end of this report):

D. Feasible and Attainable

The proposed standard easily meets the criteria for feasibility and attainability. If each combination of manufacturer, cooling capacity and efficiency is considered to be one model, there are about 60 gas storage, 32 electric storage, and 10 oil storage models that comply in the Commission's Database. Because of the practice of using various brand names and model numbers, there are hundreds more complying entries in the database.

E. Added Total Cost to the Consumer over the Design Life of the Appliance

The California Public Resources Code (25402(c)) states that standards shall not result in added total cost to the consumer over the design life of the appliance. Cost effectiveness has been calculated in several ways and meets the criteria, whichever way it is calculated.

The Federal Register notice shows the following data for the new federal standards:

**Table 10 (Unnumbered Table from Federal Register)
Vital Statistics of Today's Typical Water Heaters¹**

	<i>Gas</i>	<i>Electric</i>
<i>Current Statistics:</i>		
<i>Average Price</i>	\$383	\$380
<i>Annual Utility Bill</i>	\$160	\$256
<i>Life Expectance</i>	9 years	14 years
<i>Energy Consumption</i>	234 Therms/year	3,459 kWh/yr
<i>Statistics in Year 2004:</i>		
<i>Average New Water Heater Price*</i>	\$501	\$486
<i>Estimated Price Increase (Efficiency Only)</i>	\$58	\$101
<i>Annual Utility Bill Savings</i>	\$12.74	\$13.05
<i>Simple Payback Period</i>	3.6 years	7.4 years
<i>Average Net Saving Over Appliance Life</i>	\$30	\$23
<i>Energy Saving per Year</i>	22 therms	188 kWh

¹Energy prices used for federal payback period calculations for central air conditioners and electric water heaters are \$0.08/kWh, and for gas water heaters \$0.64/therm. (all in 1998 dollars)

* Includes expected price increases for non-energy efficiency regulations.

Commission staff calculated cost effectiveness using the method used for the Building Standards for consistency with the newly adopted Building Standards. This shows:

Table 11
Cost Implications of Proposed California Standards¹

Appliance	Estimated Design Life (Years)	Estimated Annual Statewide Sales (units)	Estimated Increase of Purchase Price Due to the Proposed Standard	Statewide Net Gain Over Design Life of Appliance \$ Thousands	Estimated Reduction in Electrical Energy Use Due to Proposed Standard (kWh/Unit/ Yr)	Estimated Reduction in Natural Gas Use Due to Proposed Standard (Therms/Unit/ Yr)	Added Total Cost Over the Design Life of the Appliance (\$)
Gas Water Heater	9	120,000	\$40	\$111,240		26	-103
Elec Water Heater	12	25,000	\$35	\$22,800	103		-76

¹The current average California natural gas cost is \$0.90. For 2009: \$0.62; for 2012: \$0.62; for 2015: \$0.63.

The above calculations were based on comparing the current federal standard with the proposed California standard. With the publication of the new federal standard, staff has repeated these calculations but compared a water heater that just meets the new federal standard with a model that just meets the proposed California standard.

The differences between the new federal standard and the proposed California standard fall into three categories:

- The federal formulae are based on rated volume, while the California formulae are based on the actual volume. The LBNL computer models used actual volume in their computer runs to calculate the cost effectiveness and savings related to the federal standards without adjusting them to account for the difference. Thus the federal technical support document indicates that the California standards for electric and oil water heaters are cost effective.
- DOE included exceptions for instantaneous water heaters and tabletop water heaters. California does also include such exceptions. DOE excluded these instantaneous water heaters since some manufacturers claimed that they were a small group that would not yield significant savings; not on the ability of such models to comply. These water heaters were included in the original legislation (NAECA) and the Commission argued that this statute did not allow DOE to reduce the stringency of a standard or to repeal a standard. Both the California and federal standards for energy factor of water heaters

have used the same formulae for storage and instantaneous water heaters ever since DOE first published the test procedure for energy factor in the early 1980 s.

- The California proposed standard for gas storage water heaters is slightly more stringent than the federal standard.

The Federal Technical Support Document describes the level adopted by DOE as Design Option number 3 and the level proposed for California as Design Option number 5. The only difference is the recovery efficiency. This difference does not involve any added cost. However, with higher values of recovery efficiency, condensation can occur in the flue which can be a problem if vented into an older masonry chimney, without the use of a redesigned venting system.

Venting of water heaters into masonry chimneys is estimated by DOE to occur in 10 percent of applications nationwide. Such installation is more rare in California than in the North East United States. DOE estimates that the use of Type B venting to avoid this problem increases the cost by between \$105 and \$114 and uses an average of \$110. Since this is only required in less than 10 percent of applications, DOE estimates the average cost at \$11.

The additional saving is estimated by DOE to be 9 therms per year or \$5.78 per year, a simple payback of less than two years. The Commission considers this assumption very conservative, since its database shows the wide availability of gas-fired storage water heaters with recovery efficiency well below the value at which condensation in the flue begins to occur. There probably is no added cost at all.

F. Conclusions

The proposed California standards are feasible and attainable. They do not result in added total cost to the consumer either when compared to the existing federal standard or the proposed 2004 federal water heater standard. The Commission should adopt the proposed California standards:

- For additional savings in energy and peak demand over current standard
- For additional savings in gas over both current and proposed federal 2004 standards
- As a backup in case the federal provisions are reduced or delayed
- Because savings in California may well result in savings in the rest of North America.

G. Small Water Heater Recommendation

Staff and the Committee recommend that the Committee's 15-Day Language be adopted without modifications. We recommend that these efficiency levels be used as the basis of any incentive programs for water heating equipment in California to encourage higher performing equipment to help mitigate electricity and gas peak issues. We further recommend that the Commission consider seeking a waiver from federal preemption.

Table 9
DOE and CEC Water Heater Standards

			DOE Standards				Commission Proposed Standards	
			Current Federal Standard		Future Federal Standard (Jan 20, 2004)		Future California Standard (about Jan 2005)	
Water Heater Type	Typical Rated Volume (gallons)	Typical Measured Volume (gallons)	Standard	Resulting Energy Factor	Standard	Resulting Energy Factor	Standard	Resulting Energy Factor
Gas-fired storage water heaters	40	38	0.62 - (.0019 * V)	0.54	0.67 - (.0019 * V)	0.59	0.685 - (.0019*V)	0.61
Oil-fired storage water heaters	40	38	0.59 - (.0019 * V)	0.51	0.59 - (.0019 * V)	0.51	0.59 - (.0019*V)	0.52
Electric storage water heaters	50	45	0.93 - (.00132 * V)	0.86	0.97 - (.00132 * V)	0.90	0.97 - (.00132*V)	0.91
Electric storage tabletop water heaters	40	36	0.93 - (.00132 * V)	0.88	0.93 - (.00132 * V)	0.88	0.97 - (.00132*V)	0.92
Gas-fired instantaneous water heaters	0.1	0.1	0.62 - (.0019 * V)	0.62	0.62 - (.0019 * V)	0.62	0.685 - (.0019*V)	0.685
Electric instantaneous water heaters	0.1	0.1	0.93 - (.00132 * V)	0.93	0.93 - (.00132 * V)	0.93	0.97 - (.00132*V)	0.97
Oil instantaneous water heaters	0.3	0.3	0.59 — (.0019*V)	0.59	No requirement		0.59 — (.0019*V)	0.59